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CONTENTS:

Realignments in the Genus Panicum. *M. L. Fernald* 61
New Species of Euphrasia from northwestern Canada. *H. M. Raup* 87
Apios americana. *Alfred Rehder* 88
Prunus virginiana, forma leucocarpa in New Brunswick. *C. E. Atwood* 89
Some Critical Plants of Greenland. *M. L. Fernald* 89
Hamamelis virginiana in Missouri. *J. A. Steyermark* 97

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CIII.

REALIGNMENTS IN THE GENUS PANICUM

M. L. Fernald

No large genus of the *Monocotyledoneae* in eastern North America can compare for difficulty of satisfactory classification with *Panicum;* and within the genus by far the most baffling aggregation is that strictly North American series which has been designated as the subgenus *Dichanthelium* Hitchc. & Chase, the heteromorphous series often called the *Dichotomum*-group, from *P. dichotomum* L., the type of the subgenus, to which at one time or another most of the species with small spikelets have been referred. After Linnaeus, the earlier systematists, mostly with conservative or orthodox conceptions of specific values, proposed, within this dominant Atlantic American group, a fair number of unquestioned species: *P. depauperatum* Muhl., *laxiflorum* Lam., *ciliatum* Ell., *strigosum* Muhl., *aciculare* Desf., *consanguineum* Kunth, *angustifolium* Ell., *microcarpon* Muhl., *spretum* Schultes, *lanuginosum* Ell., *ovale* Ell., *sphaerocarpon* Ell., *polyanthes* Schultes, *tenue* Muhl., *ensifolium* Baldw., *chamaelonche* Trin., *lancearium* Trin. and *commutatum* Schultes, and several with larger spikelets. With these well attested names to shuffle, the next two or more generations were mostly content to leave well enough alone and to recognize something as probably meant by these and some other names (now ranked as synonyms) of the same post-Linnean period.

Then, with more intensive exploration, especially of the Coastal Plain, where *Panicum,* subg. *Dichanthelium* is dominant, Scribner, of

a conservative school, or Scribner and his associates proposed a few of our best-marked species: *P. linearifolium, ovinum, Wrightianum, Thurowii, columbianum* and *equilaterale.* There was, furthermore, no balking at the reduction of intergradient plants to varietal rank or to complete synonymy: *P. Ashei* reduced to *P. commutatum, P. tennesseense* to *P. lanuginosum,* and *P. patulum* treated as a variety of *P. lanceariurn* (as *P. Nashianum patulum*). Then, with the ultra-democratic or radical reaction against orthodoxy and good usage which found expression in such gems as "Asa Gray didn't know where he was at!" and "Now the day of authority is ended," *Panicum* suddenly became a favorite source of proposed new species, especially by younger men with little or no background of general scholarship and with a minimum of experience in exact and judicious consideration of other groups, whose specific evaluations were of a conveniently mechanical uniformity not consistent with the behavior of plants in Nature. For several years Ashe and Nash held the field. The recognition of such species of the former as *P. calliphyllum, annulum, mattamuskeetense, yadkinense, roanokense, lucidum, meridionale* and *subvillosum* definitely clarifies our understanding of the group; but such remarkable names of Ashe as *P. arenicolum, filiramum, Cahoonianum, huachucae, orangensis, shallotte, parvipaniculatum* and *glabrissimum* can, fortunately, be forgotten in synonymy. Similarly, our understanding of the genus is greatly helped by the recognition of Nash's *P. perlongum, boreale, leucothrix, villosissimum* and *malacophyllum;* but there is little intellectual or taxonomic satisfaction in attempting to keep apart as species his *P. Clutei, paucipilum, atlanticum* and *tsugetorum.*

American botanists have to thank Hitchcock & Chase for their very exacting and remarkably complete study of the genus which appeared in 1910 as *The North American Species of Panicum.*[1] The making of the very detailed keys alone must have required months of work; the trailing of types and the careful drawing of their spikelets, with critical notes upon the type-specimens, are, surely, the result of years of careful research; furthermore, the very illuminating discussions after the descriptions aid tremendously in the interpretation of the specific concepts maintained. For all these features every close student of our flora must be grateful. It would, consequently, be most gratifying if the evaluations of species in the book

[1] Contrib. U. S. Nat. Herb. xv. (1910).

could all be accepted as they stand. But a close study of the work shows that two quite different groups of plants are accepted as species: 1st, the entities with sharply defined and constant or essentially constant characters in inflorescences or spikelets: *P. flexile, Gattingeri, virgatum, verrucosum, consanguineum, fusiforme, boreale, caerulescens, praecocius, thermale, sphaerocarpon, polyanthes, ensifolium, chamaelonche, Wilcoxianum, malacophyllum, Leibergii, xanthophysum, scoparium, scabriusculum, clandestinum, latifolium* and *Boscii;* and 2d, a large series of plants which are separated as "species" on "more or less" differences of an inconstant nature. Illustrative of this second group are many plants which the older systematists would unquestionably have treated as variations of other species and which a gratifyingly large group of students today would still so treat: *P. capillare* and *barbipulvinatum; P. longifolium* and *Combsii; P. anceps* and *rhizomatum; P. linearifolium* and *Werneri, P. laxiflorum* and *xalapense; P. mattamuskeetense* and *Clutei; P. dichotomum* and *barbulatum; P. meridionale* and *albemarlense; P. Lindheimeri* and *implicatum, huachucae, tennesseense, lanuginosum* and *languidum,* with essentially identical spikelets and 1st glumes; *P. villosissimum, pseudopubescens* and *scoparioides; P. Commonsianum* and *Addisonii; P. tsugetorum* and *columbianum; P. lancearium* and *patulum; P. Helleri, Scribnerianum* and *oligosanthes; P. Ashei, commutatum* and *Joorii*

In some cases active field-botanists have already protested the separation as species of members of some of these twins, triplets or sextets. Thus, in his scholarly *Plants of Southern New Jersey,* Dr. Witmer Stone speaks of "*P. albemarlense,* a species which so far as New Jersey material goes I find it impossible to separate from *P. meridionale,*"[1] and also says "So many New Jersey specimens are regarded as intermediate between *commonsianum* and *addisonii* by Hitchcock and Chase, to whom they were submitted, that it seems more reasonable to regard them as subspecies rather than as full species."[2] Wiegand & Eames, in their *Flora of the Cayuga Lake Basin,* feel that *P. tsugetorum* is "Perhaps only varietally distinct from *P. heterophyllum* [*P. columbianum*]"[3]; personally I can't get even a variety out of it. In 1929 the acute taxonomist of Indiana, C. C. Deam, in the main faithfully accepting the specific evaluations

[1] Stone, Pl. So. N. J. 203 (1910).
[2] Stone, l. c. 206 (1910).
[3] Wiegand & Eames, Fl. Cayuga L. Basin, 89 (1926).

of Hitchcock & Chase, occasionally showed a wholesome independence. "Our Indiana specimens show some variation and some have been named for me as *Panicum barbulatum* Michx. This species is separated from *Panicum dichotomum* L. by its more pubescent nodes, ... I have studied our species carefully and I believe a division of them is not warranted."[1] Of *P. tennesseense* he said: "I think all of my specimens could be safely referred to *Panicum huachucae*, regarding them as a glabrous form of that species";[2] and he specially noted his difficulty in separating *P. tsugetorum* from *P. columbianum* and *P. Ashei* from *P. commutatum*.

In the same year Weatherby, Knowlton & Bean expressed a widespread feeling in regard to the group:

As to *Panicum*, we are inclined heartily to second the remark of Professors Wiegand and Eames (Cornell Univ. Agric. Exp. Sta. Mem. xcii. 83 (1926), that "the separation of species . . . on the basis of degree of pubescence is to be regretted." Hitchcock and Chase have rendered invaluable service in patiently tracking down the types of all such proposed species and definitely placing them in a taxonomic scheme. Many of them they have reduced to synonymy. After a long pursuit of vanishing "characters" through a maze of slightly differing herbarium specimens, we suspect that the reduction might profitably be carried further. Are there any real specific lines between *P. columbianum*, *P. tsugetorum*, and *P. subvillosum; P. meridionale* and *P. albemarlense?* Where does *P. columbianum*, var. *thinium* leave off and *P. meridionale* begin? Was Bicknell, a keen observer and by no means averse to recognizing close species, right in reducing *P. oricola* to *P. meridionale* and in maintaining *P. Owenae;* or are Hitchcock and Chase, fortified by long monographic study of the genus, correct in reducing *P. Owenae* and retaining *P. oricola?*

Such questions we have, for the most part, been unable to answer satisfactorily; we have, as the most practicable method, here maintained, at least as varieties, nearly all the species recognized in recent treatments, so far as we are able to make them out in the material at hand. We have, however, accepted with a good deal of relief Prof. Fernald's telescoping of *P. Lindheimeri*, *P. huachucae*, etc., into a single species. This arrangement gives, in New England, natural ranges; and it is conducive to ease in naming specimens, a quality which should appeal strongly to anyone condemned to struggle with this group. We have followed Dr. Hitchcock's earlier reduction of *P. Clutei* to synonymy under *P. mattamuskeetense* in preference to his later re-separation of the two. *P. oligosanthes* we have omitted altogether. Material of it from the southeastern states is at least varietally distinct from *P. Scribnerianum*, and the latter may stand as a species, as species go in *Panicum;* but the New England collections referred to *P. oligosanthes* appear to us to represent only slender states of *P. Scribnerianum*. New England reports of *P. lucidum* seem also to be erroneous.[3]

[1] Deam, Grasses of Indiana, 265 (1929).
[2] Deam, l. c. 275 (1929).
[3] Weatherby, Knowlton & Bean, Rhodora, xxxi. 107 (1927).

Still more recently, Weatherby & Griscom, reporting on their field-experiences in South Carolina, found, as others have before them, the greatest confusion of the characters relied upon by Hitchcock & Chase to separate *Panicum xalapense* from *P. laxiflorum* and concluded: "it appears to us . . . . that *P. xalapense* is doubtfully separable."[1]

Somewhat earlier, as a result of attempting of understand certain tangled ("implicated") groups in *Panicum*, I had "telescoped" some of the entities which Hitchcock & Chase accept as true species: *P. barbipulvinatum* reinstated as a variety, *P. capillare*, var. *occidentale* Rydb.[2] (Surely, if Rydberg could see in it only a variety, its specific status might well be open to doubt); *P. Werneri* placed under *P. linearifolium* as a glabrous variety;[3] and *P. Lindheimeri, huachucae, tennesseense, implicatum* and *languidum* treated as a hopelessly intergradient series of variations.[4] This treatment has found reflection in the work of several later students and in writing of the group in 1930 Dr. J. M. Fogg, Jr., noted specimens of what seemed to him one plant as identified for him, some as *P. implicatum*, some as *P. huachucae*, some as *P. huachucae*, var. *silvicola;* and he stated that in his judgment "there is a well marked *meridionale* extreme and an equally characteristic *oricola* one, but between them an almost complete series of intergradations."[5]

More recently, trying again to gain a clear conception of the genus in northeastern America, I have found myself wholly in accord with the conservative views of Stone, Wiegand & Eames, Deam, Weatherby, Knowlton & Bean and Weatherby & Griscom and other field-botanists who have written me of their judgments; and I have accepted as a duty the quite unwelcome task of realigning several members of the genus, as discussed in the succeeding pages. In most of these cases, it will be noted, it is necessary only to study the very illuminating comments of Hitchcock & Chase in order to detect the confluent plants, the groups of variations which I have designated as the 2d series which they recognize as true species.

The recognition of mere tendencies or variations in response to edaphic or ecological conditions as species is too common but it completely obscures one of the most important and far-reaching laws

[1] Weatherby & Griscom, Rhodora, xxxvi. 35 (1934).
[2] See Fernald, Rhodora, xxi. 111 (1919).
[3] Fernald, Rhodora, xxiii. 194 (1921).
[4] Fernald, l. c. 141 and 223–228 (1921).
[5] Fogg, Rhodora, xxxii. 233 (1930).

of evolution, which should be at the bottom of all sound taxonomy; and, in view of the great need of scholarly and thoroughly trained taxonomists, so much emphasized in several public meetings in recent years, such a standard of values can hardly prove convincing to the really earnest and thoughtful young students whom we wish to enlist. Fortunately, they are still idealists and they are naturally attracted to the fields in which scholarly thoroughness is evident. When a plant or a series of specimens has no definite and constant character of the reproductive (conservative) structures, but differs only in having thinner or thicker leaves, weaker or stiffer culms, greater or less development of pubescence, or greener or more purple foliage, it is safe, judging from common experience of many good field-observers, to look to differences of habitat (of shade and sunshine, of chemical reactions of the soil or of moisture and aridity) as largely controlling these simple responses. Nevertheless, upon just such ecological responses somewhat intensified and upon little or no difference in the shape of spikelet or of its 1st glume have *P. languidum* and *P tennesseense* been separated from *P. huachucae* and *P. Lindheimeri*, *P. albemarlense* from *P. meridionale*, *P. pseudopubescens* and *P. scoparioides* from *P. villosissimum*, *P. patulum* from *P. lancearium* and *P. Joorii* from *P. commutatum*.

The recognition of such tendencies as true species and the illogical disinclination to call them varieties (or merely forms or states in some cases) has had many advocates. One of the most consistent defenders of as yet not sharply differeniated plants as "species" was the late Dr. Rydberg. So consistent was Rydberg's attitude on this point, that it is almost startling to find an occasional variety designated by him.[1] Rydberg's philosophy, clearly expressed, was stated to the International Congress of Plant Societies at Ithaca:

> Until we have discovered and described all, or most, of the great number of yet unknown forms, and until the species have been tested by cultivation, breeding, changing of soil environment, etc., they naturally have to remain tentative. I leave it to others to find out whether the characters, prominent or trifling as they may be, on which they are based, are constant enough to place them as distinct species. I think that I have done a service to taxonomy if I have pointed out existing characters. I also think that a form that is worth describing, also should have a name.

[1] Some years ago I chanced to overhear a bit of conversation at the Gray Herbarium, which others should enjoy. Miss Alice Eastwood was catechizing Rydberg regarding one of his segregations, which he defended as necessary in order that he should be consistent. Miss Eastwood retorted, "Hang consistency!", to which came the rejoiner in Rydberg's high-pitched voice: "Some folks would call that female."

I prefer a binomial. When I use a binomial I do not pretend that it means the same as a species in Hall-Clements style. I do not pretend to be able to pass on its rank, because in most cases it is impossible.[1]

Somewhat earlier Rydberg had expressed his view of species in these words: "My intention is not to defend them [his own segregates] as species. The limitation between species and variety will always be arbitrary, so also between variety and form [therefore call every recognizable trend a "species"!]. . . . What he [Fernald] and many others call varieties, I call species."[2] Some others with the same philosophy are readily recalled and the defenders of many of the "redundant"[3] Panicums can hardly be called conservative.

Nevertheless, although in some cases, especially of plants described from scrappy bits of specimens otherwise quite unknown to the phytographer, the constancy of characters cannot always be confidently asserted, it certainly cannot be rightly maintained that an experienced and careful taxonomist, after many years of study of plants in the field and in the herbarium, can "not pretend to be able to pass on its rank," and that "in most cases it is impossible." Surely, when the common experience of really careful and thoughtful observers and the large accumulation of specimens in our greater herbaria shows a plant essentially invariable in its fundamental reproductive characters, it is quite possible (even simple) to note its vast difference from a series which lacks stability in the same characters. Many justly honored taxonomists have clearly comprehended that there are such differences; and the differentiation between true or stable species, on the one hand, as opposed to inconstant or unstable ones, on the other, is absolutely necessary if taxonomy is to hold its honored place in science. It is almost a truism that "conservative" and essentially unvarying species characterize the more ancient floras and faunas—the relic species persisting from the earlier geological epochs in the evolution of plants and animals. It is equally a truism, that in recently disturbed or altered areas a stimulation and multiplication of variations has occurred and that under such conditions inconstant and plastic species luxuriate. The members of *Panicum*, subg. *Dichanthelium* have their greatest development on the relatively youthful Atlantic coastal plain of North America, and the subgenus shows its youth, in the first place, by its

[1] Rydb. in Proc. Intern. Congr. Pl. Sci. ii. 1544, 1545 (1929).
[2] Rydb. Bull. Torr. Cl. xxxviii. 352–354 (1911).
[3] See Rhodora, xxiii. 141 (1921).

multiplication of variations and its aggressiveness, in the second, by its restriction to North America, with most of its species on or near the geologically young coastal plain.

The relative youth of *Panicum* subg. *Dichanthelium* is strikingly contrasted with the great age of some other members of the *Paniceae*. *Valota*, for instance, is a small genus (about 12 species) sharing warm parts of America with Australia; and *Leptoloma* has one very uniform species in North America, the other three in Australia. Since Australia was cut off from its connection with the other continents by mid-Cretaceous time, it follows that *Valota* and *Leptoloma* have had a tremendously long existence; their species are few and stable. *Panicum*, subg. *Dichanthelium*, restricted to North America, where it is chiefly developed in the most youthful regions, and without representation in the ancient flora of Australia, is, by inference at least, a more youthful group. Its behavior certainly so indicates. Is it not significant, therefore, that this group should contain so many poorly differentiated, so-called "species"? Failure to recognize that they belong to a different class from the stable and ancient species obscures one of the most illuminating demonstrations of evolution we have in our living flora.

After Rydberg had expressed at Ithaca his inability to judge the validity of his own generic and specific segregations, Dr. Skottsberg made a trenchant and very sound reply. His telling examples and direct refutation of the weak attitude of the extreme "splitter," especially of genera, should be carefully studied by all who are not beyond redemption. It is impossible here to republish his complete rejoinder, but I may be pardoned for passing on certain pregnant passages, even though they deal primarily with generic, rather than specific, segregation. The principles involved are equally applicable to the segregation of confluent "species."

> What do we gain by splitting? In some cases, in many perhaps, the operation is necessary. If we find a black sheep hidden in an otherwise natural genus, small or large, drive it out, of course, and make a new genus for it, if this be necessary. Nobody will fail to give you credit for that. . . . But apart from such instances, what can the reason be for these almost convulsive efforts to segregate everywhere? Some people say there is a good deal of personal vanity at the bottom of it, but that I refuse to believe. A serious taxonomist will do no such thing. No, as Dr. Rydberg told us in his paper: when a genus becomes "too large" it is time to split it up so that we may get a better oversight over it. I cannot see the point there. As if a large genus would become easier to handle only because we call its sections genera? Have we really got a

better and clearer idea of the genus *Cereus* after Britton and Rose cut it up into 75 pieces? Those who think so, deceive themselves. We get lots of new names to remember and scores of new synonyms to keep a record of, that is about all—we do not gain a single thing by making genera sub-tribes and sections genera, but we lose a great deal. We lose the firm hold on good natural groups, we lose useful and pleasing associations of minds, more so if we put, as is done so often now, equal weight on vegetative as on floral characters. We efface interesting facts regarding geographical distribution. I think it is quite fascinating to observe how a genus like *Viola*, a very natural genus indeed, has developed, under different conditions, . . . Split up this genus, and that wonderful display of life-forms passes out of sight. Had the Hawaiian species grown in Oregon and the Andean in the Rocky Mountains they would not have been violets any more. For if the genus *Pinus* is split, anything may happen.

Suppose we have a natural genus (taken in a wide, conservative sense) that has developed one section in Europe, another in Asia, a third in America, showing characters that give us certain hints as to the early history of the genus and at the same time so well separated from each other that the splitter has a fair chance to set to work, will it not appear to us that we know, as it were, less about the three new genera than about the single old one unless we are able always to remember that, once upon a time, the three used to be one?

. . . . . .

The limitation of genera is a matter of both good knowledge—and of the whole assemblage, not only of the species in one section of the area—and good taste. . . .

It would be well if those who are less keen on changes for changes' own sake would join in an appeal to those who believe that change in taxonomy always means development, asking them, before they spoil a good old genus, to stop and ask themselves: what does botany gain? Are not, after all, these new genera like rockets, rising with brilliancy only to slump down and fall into oblivion, increasing the burden of synonyms that all of us curse?[1]

As already stated, the conservative viewpoint, so well expressed by Skottsberg regarding genera, applies equally well to species. The inordinate segregation of species without sharp differentiations truly "effaces interesting facts."

Panicum longifolium Torr., var. **Combsii** (Scribn. & Ball), comb. nov. *P. combsii* Scribn. & Ball, U. S. Dept. Agr. Div. Agrost. Bull. no. 24: 42, fig. 16 (1901).

P. longifolium, var. **pubescens** (Vasey), comb. nov. *P. anceps*, var. *pubescens* Vasey, U. S. Dept. Agr. Div. Bot. Bull. no. 8: 37 (1889).

Panicum longifolium Torr., originally described from New Jersey, has four usually well-defined but clearly confluent geographic varieties: var. *tusketense* Fern., Rhodora xxiii. 192 (1921), known only

[1] Skottsberg, Proc. Internat. Congr. Pl. Sci. ii. 1554, 1555 (1929).

from the valley of the Tusket River in Nova Scotia; typical *P. longifolium*, following the Coastal Plain from southeastern Massachusetts to Florida; var. *Combsii*, extending from southern Georgia and northern Florida to Louisiana; and var. *pubescens* occurring, likewise, from Florida to Louisiana. The diagnostic characters of the four varieties follow.

a. Plants 2–9 dm. high; culms 1–3 mm. broad at the 1st exposed node; principal sheaths 0.5–1.5 dm. long, 15–40-nerved at summit, glabrous (exceptionally villous); longer blades 1–3.5 dm. long, 3–6 mm. broad, glabrous (exceptionally villous); larger panicles 0.3–2.3 dm. long, 0.1–1.5 dm. broad. . . . .*b.*

b. Branches and branchlets of panicle ascending, the mature branchlets appressed or subappressed.

Spikelets 2–3 mm. long, the 2nd glume equaling or longer than the sterile lemma; longer branches of panicle 3–14 cm. long. . . . . *P. longifolium* (typical).

Spikelets 2.6–3.4 mm. long, the 2nd glume usually shorter than the sterile lemma; longer branches of panicle 0.1–8 cm. long. . . . . Var. *tusketense.*

b. Branches and branchlets of mature panicle strongly (often horizontally) divergent; spikelets 3–4 mm. long, with tips often sharper; 2nd glume equaling or slightly exceeding the sterile lemma; longer branches of panicle 5–10 cm. long. . . . . Var. *Combsii.*

a. Plants 8–10 dm. high; culms 3–6 mm. broad at the 1st exposed node; principal sheaths 1–2.5 dm. long, 25–50-nerved at summit, usually densely villous; longer blades 3–7 dm. long, often overtopping the panicle, 5–8 mm. broad, usually villous; larger panicles 2–4 dm. long, 1–2 dm. broad, in maturity with horizontally divergent branches and branchlets; spikelets 2–2.5 mm. long. . . . . Var. *pubescens.*

Typical *P. longifolium*, described by Torrey from "the pine barrens of New Jersey," with "*Culm* about 2 feet high . . . . *Sheaths* . . . somewhat hairy at the throat" but otherwise the "whole plant very smooth," the "*Panicle* with few appressed branches," is the only variation of the species found north of Georgia, except for the superficially similar but isolated Nova Scotian var. *tusketense*. On the basis of pubescence of foliage (a most fickle vegetative character) the 51 sheets before me of typical *P. longifolium* and var. *tusketense* fall into the following grouping.

Foliage strictly glabrous (except for ligule), 41: Nova Scotia, 12; Massachusetts, 4; Rhode Island, 7; Connecticut, 7; New Jersey, 5; Maryland, 2; Georgia, 1; Florida, 3.

Sparse villosity on 1 or more sheaths or blades, 9: Connecticut, 1; New Jersey, 4; Delaware, 1; Virginia, 1; Georgia, 1; Florida, 1.

Abundant and conspicuous villosity on sheaths and blades, 1: Delaware, 1.

From these figures it is clear that typical *Panicum longifolium* is an

essentially glabrous plant, "whole plant very smooth," to use Torrey's diagnostic phrase. Consequently, in vainly attempting to find the specific lines which separate from it *P. Combsii*, it is at least not reassuring to find them stated by Hitchcock & Chase as follows:

> This species [*P. Combsii*] is closely related to *P. longifolium* from which it may be distinguished by its shorter blades, longer spikelets, and usually by the lack of pubescence.

In their key Hitchcock & Chase (N. Am. Pan., Contrib. U. S. Nat. Herb. xv. 99) group *P. longifolium* and *P. Combsii* under the call:

> Ligules ciliate; basal leaves half as long as culm or more; panicle much exceeding the upper leaves.

Certainly it is most difficult to detect any constant difference in the foliage of the two. We then hopefully turn to the stated diagnostic characters:

> Spikelets not over 2.7 mm., usually 2.5 mm. long, the first glume less than half that length; ligules 2 to 3 mm. long. . 53. *P. longifolium.*
> Spikelets 3 to 3.5 mm. long; first glume two-thirds to three-fourths that length; ligule less than 1 mm. long. . . . . 54. *P. combsii.*

In the original diagnosis of *P. Combsii*, Scribner & Ball, likewise, described the "first glume . . . two-thirds to three-fourths the length of the spikelet"; but their illustration of the plant might well have been drawn from a New Jersey, New England or Nova Scotian specimen of *P. longifolium*, for the artist showed the first glume only two-thirds the length of the spikelet, a proportion not difficult to find in specimens of *P. longifolium* all the way north to Nova Scotia. I have carefully measured characteristic spikelets and their first glumes in all three series with the result shown in the accompanying table.

	Typical P. LONGIFOLIUM	1st Glume.	Spikelet.	Proportion (per cent)
Marion, Massachusetts,	*Fernald*, no. 783	1.7 mm.	2.8 mm.	.53
Dartmouth, Massachusetts,	*Eaton & Griscom*	2	3	.66
Pasque I., Massachusetts,	*Fogg*, no. 3787	1.9	3	.63
Hopkinton, Rhode Island,	*Collins & Fernald*, no. 11,245	1.5	3	.50
Lake Worden, Rhode Island,	*Faxon*	1.8	3	.60
Westerly, Rhode Island,	*Ware et al.*	1.9	3	.63
Richmond, Rhode Island,	*Fernald & Collins*	1.7	3	.57
Killingworth, Connecticut,	*Weatherby*, no. 3763	1.4	3	.37
Killingworth, Connecticut,	*Weatherby*, no. 2514	1.8	3	.60
Groton, Connecticut,	*Graves*, no. 256	1.5	2.7	.55
Groton, Connecticut,	*Woodward*	1.6	3	.53
Southington, Connecticut,	*Bissell*, no. 5529	1	2	.50
Long Branch, New Jersey,	*Wm. Boott*	2	3	.66
Burlington Co., New Jersey,	*Parker*	1.7	2.8	.60
Pine Barrens, New Jersey,	*A. Gray*	1.5	2.8	.53

	Typical P. LONGIFOLIUM	1st Glume.	Spikelet.	Proportion (per cent)
Cold Spring, New Jersey,	*Gershoy*, no. 52	1.2	2.4	.50
New Lisbon, New Jersey,	*MacElwee*	1.2	2.4	.50
Rehoboth, Delaware,	*Churchill*	1.5	2.5	.60
Talleyville, Delaware,	*Commons*	1.6	2.6	.58
Clinton, Maryland,	*Holm*	2	3	.66
Cape Henry, Virginia,	*Am. Gr. Nat. Herb.*, no. 50	1.8	2.8	.64
Sumter Co., Georgia,	*Harper*, no. 1081	2	3	.66
Gainesville, Florida,	*Am. Gr. Nat. Herb.*, no. 51	1.2	2	.60

Range of 1st Glume: 37–66 (av. 58) per cent. of length of Spikelet.

Var. TUSKETENSE

Kemptville, Nova Scotia,	*Fernald & Long*, no. 23,191	1.8	2.9	.63
Gilfilling L., Nova Scotia,	*Fernald & Long*, no. 23,190	2	3	.66
Butler's L., Nova Scotia,	*Fernald et al.*, no. 19,763	1.8	3.2	.56
Pearl L., Nova Scotia,	*Fernald & Linder*, no. 19,761	1.6	2.6	.58
Tusket R., Nova Scotia,	*Fernald et al.*, no. 19,765	1.7	3	.57
Tusket L., Nova Scotia,	*Fernald et al.*, no. 19,759	1.5	2.8	.53
Butler's L., Nova Scotia,	*Fernald et al.*, no. 19,764	1.8	3	.60

Range of 1st Glume: 53–66 (av. 60) per cent. of length of Spikelet.

Var. COMBSII

Coffee Co., Georgia,	*Harper*, no. 2014	2.1	3.5	.60
Berrien Co., Georgia,	*Harper*, no. 1679	2	2.8	.71
Chipley, Florida,	*Combs*, no. 583 (COTYPE)	2–2.2	3	.66–.73
Pensacola, Florida,	*Curtiss*, no. 6919	2.5	4	.63
Gateswood, Alabama,	*Tracy*, no. 8408	2.2	3.5	.63
New Orleans, Louisiana,		2	3.6	.55

Range of 1st Glume; 55–73 (av. 64) per cent. of length of Spikelet.

These measurements distinctly show the futility of attempting the separation of *Panicum Combsii* as a species distinct from *P. longifolium* because the former has the "Spikelets 3 to 3.5 mm. long; first glume two-thirds to three-fourths that length," while the latter has "Spikelets not over 2.7 mm., usually 2.5 mm. long, the first glume less than half that length." Of the comparatively few sheets seen of *P. Combsii*, 1 has the spikelets less than 3 (2.8) mm. long and only 2 have the glumes of the required length, the remaining sheets showing them well under two-thirds, and in one case only slightly more than one-half the length of the spikelets. All these sheets were labelled by Hitchcock & Chase *P. Combsii*.

In true *P. longifolium*, furthermore, it is a somewhat exceptional specimen which has the spikelets "not over 2.7 mm., usually 2.5 mm. long." Of the 23 measured (because well developed) 16 have spikelets longer, 2.8–3 mm., the latter measurement being most frequent. As to the length of the 1st glume, it is significant that in only a single

collection have I found the 1st glume "less than half" the length of the spikelet, while in several cases it reaches the reputed "two-thirds . . . that length" of *P. Combsii*. In the most northern extreme, *P. longifolium*, var. *tusketense*, furthermore, the spikelets stand midway in length between those of the very southern var. *Combsii* and of the geographically intermediate typical *P. longifolium*, while the glumes of the northernmost extreme average three-fifths as long as the spikelets.

Similarly with the reputed difference in the ligule. Harper's no. 1679 from Berrien County, Georgia, is cited (from Tifton) by Hitchcock & Chase as *P. Combsii* and the specimen in the Gray Herbarium so labelled by them has very orthodox glumes (71 per cent. the length of spikelet) but it is heterodox in having spikelets only 2.8 mm. long; and its ligules, which in *P. Combsii* should be "less than 1 mm. long," wholly break the bounds by measuring 3.5 mm. in length! On the contrary, in much northern material, for example *Graves*, no. 256, from Groton, Connecticut, cited as *P. longifolium* by Hitchcock & Chase, it is easy to find ligules not more than 1.5 mm. long.

Although breaking down as a species, *Panicum Combsii* may be maintained as a geographic variety. Its glumes and sterile lemma are more attenuate at tip than in the other varieties and its mature panicle, as shown by the cotype and other mature specimens, has more horizontal branches and branchlets than in true *P. longifolium* and var. *tusketense*. In its more divaricate branching var. *Combsii* simulates the coarser southern plant, var. *pubescens*. That variety, however, has relatively small spikelets, and its very long leaves, as beautifully exemplified in *Tracy*, no. 6507a, may greatly overtop the panicles.

Panicum anceps Michx., var. **rhizomatum** (Hitchc. & Chase), comb. nov. *P. rhizomatum* Hitchc. & Chase, Contr. U. S. Nat. Herb. xv. 109, fig. 104 (1910).

Only by those who recognize species which are confluent and which are separated solely on "more or less" difference in size and habit, without technical morphological characters, can *Panicum rhizomatum* be maintained as a species. Its leading diagnostic characters, as given by its authors, are found in their key:

Panicle open; spikelets 3.4 to 3.8 mm. long (shorter in exceptional specimens) . . . . . 55. *P. anceps.*
Panicle more or less contracted; spikelets not over 2.8 mm. long. 56. *P. rhizomatum.*

In their fuller discussion of *Panicum anceps* they note that the "open" panicle may be "occasionally narrower" or with "branchlets . . . approximate, producing densely flowered branches," while in *P. rhizomatum* "In occasional specimens the panicle is rather open but less so than in *P. anceps;* but the following three specimens, having all the characters of *P. rhizomatum,* have panicles as open as those of *P. anceps,* the small spikelets secund as in that species, and appear to be intermediates." There is sufficient evidence that they *are* intermediates. In spite of the spikelets of *P. anceps* being defined as "3.4 to 3.8 mm. long," there are "occasional specimens with smaller spikelets; . . . only 3 to 3.2 mm. long. Such . . . being nearly glabrous plants with open panicles, are referred here, though in the smaller spikelets they approach the next species [*P. rhizomatum*]."

If additional evidence were needed that *P. rhizomatum* is only a variation of *P. anceps,* it appears in sheets sent out from the National Herbarium to illustrate the two. The plant from Maryland, Amer. Gr. Nat. Herb. no. 54, distributed as *P. anceps,* "As described by Hitchcock & Chase," therefore conforming to their conception of the species, has the fully mature panicle of the same breadth but with slightly more ascending branches (less open panicle) than the mature panicle of their no. 56, distributed as an authentic representative of *P. rhizomatum.* In no. 54 the spikelets are only 3–3.2 mm. long, while the mature panicle of no. 56 displays some still persistent spikelets 3 mm. long. Again, compare *Curtiss,* no. 5747 and Biltmore Herb. no. 696[b] from Florida. The former is cited in *The North American Species of Panicum* as good *P. rhizomatum* and from its freely developed rhizomes and small spikelets is a good illustration of that plant. The latter (696[b]) is cited without question as *P. anceps* ("spikelets 3.4 to 3.8 mm. long"). Nevertheless, the very full sheet in the Gray Herbarium, bearing the Hitchcock & Chase revision label, looks like the other and its spikelets range from 3.2 down to 2.5 mm. in length.

Panicum agrostoides Spreng., var. **condensum** (Nash), comb nov. *P. condensum* Nash in Small, Fl. Se. U. S. 93, 1327 (1903).

Panicum condensum in its most extreme development is very different from the most ideal material of *P. agrostoides;* but, unfortunately, neither of them consistently stays close to the ideal. The beautifully clear key-characters published by Hitchcock & Chase would, if they held in a larger proportion of cases, be satisfactory. As stated by them the two differ as follows:

Spikelets 1.8 to 2 mm., in occasional specimens 2.2 mm. long; panicle branches ascending or spreading.....50. *P. agrostoides.*
Spikelets about 2.5 mm. long; panicle branches erect or nearly so. 51. *P. condensum.*

Turning to their fuller accounts, contradiction is promptly discovered: the spikelets of *P. condensum* are there described, not as "about 2.5 mm. long" (the key-character), but as "2.2 to 2.5 mm. long," *i. e.* as over-lapping in measurement. Furthermore, many specimens placed under *P. agrostoides* "have rather turgid spikelets 2 to 2.2 mm. long, more or less crowded on the ascending but not appressed branches and appear to be intermediate between *P. agrostoides* and *P. condensum.* These are not cited in the distribution given below."[1] Then follows an enumeration of such transitional plants from stations from the northeastern to the southeastern and the southwestern limits of the species; while in *P. condensum* "In occasional specimens . . . . the panicle branches are ascending, the panicle not contracted, thus approaching *P. agrostoides.*"

In the representation of the species in the Gray Herbarium 63 per cent. of the specimens are characteristic *P. agrostoides*, 10 per cent. thoroughly good *P. condensum;* but 27 per cent. are admitted intermediates. That is too large a proportion of transitional specimens. The specifications, if they are desired by any student, will be gladly furnished; their detailed enumeration here would make a discussion so similar to those under *P. anceps* and *P. longifolium* as to seem unnecessary.

P. LAXIFLORUM Lam., var. **strictirameum** (Hitch. & Chase), comb. nov. *P. xalapense strictirameum* Hitchc. & Chase, Contrib. U. S. Nat. Herb. xv. 161 (1910).

Although I am unable to find such definite trends as to keep *Panicum xalapense* HBK. (1816) apart from *P. laxiflorum* Lam. (1798), even as a variety or reasonably constant form, var. *strictirameum,* in its closer panicle of smaller and more rounded spikelets, is a striking departure from the commoner and wider-spread *P. laxiflorum.*

The characters used by Hitchcock & Chase to separate *P. xalapense* from *P. laxiflorum* are the following:

Blades ciliate and more or less pilose on the surface; spikelets 2 mm. long.....87. *P. xalapense.*
Blades glabrous or nearly so on the surface and margin; spikelets 2.2 mm. long.....86. *P. laxiflorum.*

[1] One cannot help calling to mind those trustful amateurs who, a generation ago, religiously cast into the waste-basket all specimens not conforming closely to "the books."

However, some cited specimens of the "glabrous" *P. laxiflorum* "have pilose blades like those of *P. xalapense;* the spikelets are 2.2 to 2.3 mm. long." Many of the specimens identified in the Gray Herbarium by Hitchcock & Chase and cited in their *North American Species of Panicum* as *P. xalapense* (presumably on account of a few trichomes or cilia on the foliage) have spikelets fully 2.2 mm. long and some of them actually 2.5–2.6 mm. long (larger than allowed for *P. laxiflorum*): *Biltmore Herb.*, no. 2993a; *Canby*, no. 106, "exceptional in having almost glabrous sheaths"; *Tracy*, no. 7202; *Curtiss*, no. 6602; etc. Conversely, numerous collections treated authoritatively as *P. laxiflorum* depart uncomfortably from the specifications: *Nash*, no. 239 (type-no. of *P. pyriforme* Nash), with spikelets 2.4–2.5 mm. long and some leaf-blades pilose nearly to the tip; *Churchill*, from South Jacksonville, April 11, 1897, with spikelets 2.5 mm. long but specially noted on the sheet by Mrs. Chase as "exceptionally pubescent"; *Tracy*, no. 7388, with spikelets as small as in the most theoretical *P. xalapense;* etc. The type of *P. xalapense*, with "spikelets 2 mm. long" (*H. & C.*) came from Mexico, and Hitchcock & Chase restrict *P. laxiflorum* with spikelets larger ("2.2 mm. long") to Georgia, Florida and Alabama. Nevertheless, *Pringle*, no. 13,250, from Hidalgo in Mexico, has the well developed spikelets 2.2–2.3 mm. long; and Hitchcock's collection from the type locality, Jalapa (Amer. Gr. Nat. Herb. no 84), shows some spikelets 2.2 mm. long.

Further discussion seems unnecessary.

P. MERIDIONALE Ashe, var. **albemarlense** (Ashe), comb. nov. *P. albemarlense* Ashe, Journ. Elisha Mitchell Soc. xvi. 84 (1900).

At best *P. albemarlense* seems to be only an extreme of *P. meridionale*. I have collected one or the other scores of times and am unable to find any morphological character to separate them; and it is significant that Hitchcock & Chase relied wholly on a habital tendency and on degree of pubescence:

> Autumnal form widely decumbent-spreading, forming a mat; vernal culms soon geniculate-spreading; plants olivaceous. 122. *P. albemarlense.*
>
> Autumnal form erect or leaning, never forming a mat; plants yellowish-green. . . . . 121. *P. meridionale.*

In the fuller discussion, however, they say of *P. albemarlense:* "Allied to *P. meridionale*, from which it differs mostly in the usually stouter, spreading culms, which often form large mats in the autumn, and in the softer, denser pubescence."

My own interpretation is that *P. columbianum thinium* Hitchc. & Chase, Rhodora, x. 64 (1908) is inseparable from *P. meridionale*. The habit is identical, and in all technical points they seem the same: "blades 1.5 to 4 cm. long, . . . long-pilose on the upper surface, . . . panicles 1.5 to 4 cm. long, nearly or quite as wide, ... spikelets 1.3 to 1.4 mm. long," etc. in *P. meridionale;* "blades rarely over 3 cm. long, sparsely pilose with long hairs on the upper surface . . . ; panicles 1.5 to 4 cm. long, about as wide; spikelets 1.3 to 1.4 mm. long" in *P. columbianum*, var. *thinium*. By definition there should be a difference in the length of ligules: in *P. columbianum* "ligules less than 1 mm. long," in *P. meridionale* "ligules 3 to 4 mm. long." Nevertheless, on the sheet in the Gray Herbarium specially sent out by Professor Hitchcock as typical *P. meridionale* (Amer. Gr. Nat. Herb. no. 122) it is difficult to find ligules as much as 1 mm. long.

P. lanuginosum Ell., var. **fasciculatum** (Torr.), comb. nov. *P. dichotomum*, β. *fasciculatum* Torr. Fl. No. and Mid. U. S. 145 (1824). *P. nitidum*, α. *ciliatum and* δ. *pilosum* Torr. l. c. 146 (1824). *P. huachucae* Ashe, Journ. Elisha Mitchell Soc. xv. 51 (1898). *P. tennesseense* Ashe, l. c. 52 (1898). *P. unciphyllum*, forma *prostratum* Scribn. & Merr. Rhodora, iii. 124 (1901). *P. lanuginosum*, var. *huachucae* (Ashe) Hitchc. Rhodora, viii. 208 (1906). *P. huachucae*, var. *silvicola* Hitchc. & Chase, Rhodora, x. 64 (1908). *P. languidum* Hitchc. & Chase, Contrib. U. S. Nat. Herb. xv. 232 (1910). *P. huachucae*, var. *fasciculatum* (Torr.) Hubbard, Rhodora, xiv. 171 (1912). *P. Lindheimeri*, var. *fasciculatum* (Torr.) Fern. Rhodora, xxiii. 228 (Jan. 26, 1922, the number dated "October," 1921).

P. lanuginosum, var. **implicatum** (Scribn.), comb. nov. *P. implicatum* (Scribn.) U. S. Dept. Agric. Div. Agrost. Bull. 11: 43, fig. 2 (1898). *P. unciphyllum implicatum* (Scribn.) Scribn. & Merr. Rhodora, iii. 123 (1901). *P. Lindheimeri*, var. *implicatum* (Scribn.) Fern. Rhodora, xxiii. 228 (Jan., 1922, misdated Oct., 1921).

P. lanuginosum, var. **Lindheimeri** (Nash), comb. nov. *P. Lindheimeri* Nash, Bull. Torr. Bot. Cl. xxiv. 196 (1897). *P. Lindheimeri*, var. *typicum* Fern. Rhodora, l. c. 227 (1922).

P. lanuginosum, var. **septentrionale** (Fern.), comb. nov. *P. Lindheimeri*, var. *septentrionale* Fern. Rhodora, xxiii. 227 (Jan., 1922, misdated Oct., 1921).

When I reduced[1] to *Panicum Lindheimeri* many freely intergradient plants, I failed to go far enough. In its broad panicle with freely forking branches and long pedicels, in its obovoid, pubescent spikelets with characteristic short and broad 1st glume, in the shape

[1] See Rhodora, xxiii. 141 and 223–228 (1921, 1922).

of its foliage and in its autumnal branching *P. lanuginosum* Ell. Bot. S. C. and Ga. i. 123 (1816) seems too difficult to separate *specifically* from the many plants enumerated in the preceding synonymy. The only strong tendency which separates it from them is the often denser and shorter pubescence. This, in the main, is good, but the leaf-margins often have the papillose-ciliate character of the others and the upper surfaces have a few of the long trichomes which characterize some of the other variants. Without morphological characters of the spikelets or inflorescence, but distinguished only on its usually denser pubescence, *P. lanuginosum* seems hardly separable *specifically* from the others.

Ashe, who was not averse to recognizing any variant as a "species," could not clearly distinguish *P. lanuginosum* and *P. huachucae* (see Hitchc. & Chase, p. 221). Hitchcock, in 1906, treated the two as conspecific; and Scribner & Merrill, in 1901, merging *P. implicatum* with the plants which have been separated as *P. huachucae*, but, unfortunately, under the confused name *P. unciphyllum* Trin., put *P. tennesseense* into *P. lanuginosum* and correctly said: "*Panicum lanuginosum* is extremely variable and often can only be separated arbitrarily from the related species—it is possible that it should be considered only as a variety of the preceding species." According to Hitchcock & Chase, in *P. lanuginosum* "The vernal form . . . . resembles *P. huachucae silvicola* but is larger and more velvety"; but, curiously, although *P. lanuginosum* is sharply separated in their key in *The North American Species of Panicum* by being "velvety-pubescent," while *P. tennesseense, implicatum, languidum, huachucae*, etc. are merely "pubescent, often villous, but not velvety," *P. ciliosum* Nash, referred definitely by them to the synonymy of the "velvety" *P. lanuginosum*, "differs in having blades glabrous on the upper surface or with a few long hairs only, but not velvety," and numerous other specimens, "because of the lack of velvety pubescence on the upper surface of the blades, may be referred to this form" (H. & C., p. 221).

The instability of the other members of this aggregate-species was sufficiently elucidated in Rhodora, xxiii. 141 and 223–228 (1921, 1922). More than a decade of later experience has strengthened the conviction that they are not specifically separable. *P. lanuginosum* Ell. (1816) is, apparently, the oldest specific name for this particularly involved group.

P. VILLOSISSIMUM Nash, var. **pseudopubescens** (Nash), comb. nov. *P. pseudopubescens* Nash, Bull. Torr. Bot. Cl. xxvi. 577 (1899).

P. VILLOSISSIMUM, var. **scoparioides** (Ashe), comb. nov. *P. scoparioides* Ashe, Journ. Elisha Mitchell Soc. xv. 53 (1898).

It is most difficult to find any constant character of the inflorescence to separate *P. pseudopubescens* and *P. scoparioides* from *P. villosissimum*. The subappressed pubescence of the former sets off a large series of specimens and these may appropriately stand as a variety. Although maintaining *P. pseudopubescens* as a species, Hitchcock & Chase do not give very emphatic distinctions:

> Vernal form similar to that of *P. villosissimum;* . . . pubescence [of spikelets] as in *P. villosissimum;* winter leaves as in *P. villosissimum.*
>
> This species is very closely allied to *P. villosissimum* and occasional specimens are about as close to one type as to the other.

Numerous specimens corroborate this opinion.

As to *P. scoparioides*, it seems to differ chiefly in its smoother quality, with sparser and shorter trichomes and in a tendency to have less exserted primary panicles. It is also very localized and scattered in occurrence; and it is possible that it is not a well established type, but rather a series of sporadic colonies resulting from the crossing of one of the glabrous species with small and pubescent spikelets, like *P. lanuginosum* Ell., var. *septentrionale* Fern., with the slightly coarser *P. oligosanthes* Schultes, var. *Scribnerianum* (Nash) Fern. The very few collections at hand look like the result of such a hypothetical cross.

P. COLUMBIANUM Scribn., var. **oricola** (Hitchc. & Chase), comb. nov. *P. oricola* Hitchc. & Chase, RHODORA, viii. 208 (1906).

Panicum oricola, as a coastwise variety of the wider-ranging *P. columbianum* (including *P. tsugetorum* Nash), seems to stand to that species in the same relation as *P. albemarlense* to *P. meridionale:* a more depressed and more pubescent extreme of the open sands, without significant difference in spikelet. I get no mental satisfaction from striving to keep *P. tsugetorum* apart from *P. columbianum*. In the 7th edition of Gray's Manual Hitchcock defined the almost indefinable difference: in the former "*spikelets* 1.9 *mm. long*," "*blades* 5–6 *cm. long*"; in the latter "*spikelets* 1.7 *mm. long*," "*blades* 5 *cm. long or less.*" In *The North American Species of Panicum*, however, *P. tsugetorum* is given "spikelets 1.8 to 1.9 mm. long" and "blades 4 to 7 cm. long," while these critical measurements in *P. columbianum* appear as "1.5 to 1.6 mm." and "3 to 6 cm." respectively. Further clinching

their essential identity, Mrs. Chase collects and distributes, to stand as authentic *P. columbianum* with "spikelets 1.5 to 1.6 mm. long," material (Am. Gr. Nat. Herb. no. 148) with many spikelets well over 1.6 mm. in length.

P. LANCEARIUM Trin., var. **patulum** (Scribn. & Merr.), comb. nov. *P. Nashianum patulum* Scribn. & Merr. U. S. Dept. Agric. Div. Agrost. Circ. no. 27: 9 (Dec. 4, 1900). *P. patulum* (Scribn. & Merr.) Hitchc. RHODORA, viii. 209 (1906).

Var. *patulum* was originally considered by Scribner & Merrill a variety of *P. Nashianum* Scribn. (1897), a species which Hitchcock & Chase identify with *P. lanceariun* Trin. (1826). The evaluation of *P. patulum* by Scribner & Merrill seems to have been thoroughly justified: "This variety is closely related to the species, intermediate forms occurring." Hitchcock & Chase maintain *P. patulum* as a distinct species on what seem like minor ecological characters:

Blades firm, glabrous above; culms stiffly ascending..164. *P. lancearium.*
Blades lax, softly puberulent on both surfaces; culms decumbent.
165. *P. patulum.*

Nevertheless, they assign the culms of the "stiffly ascending" *P. lanceariun* "a more or less geniculate base," while in the description the leaves become "usually glabrous on the upper surface" and the autumnal culms are "geniculate-spreading." "The following [7] specimens approach *P. patulum* in habit or in having papillose, more rounded spikelets, but the blades are not pubescent on the upper surface, or but one or two are pubescent"; while in the "readily distinguished" *P. patulum* "the blades are sometimes only obscurely pubescent above." Of the specimens of the two in the Gray Herbarium fully one-fourth are transgressors.

P. OLIGOSANTHES Schultes, var. **Scribnerianum** (Nash), comb. nov. *P. Scribnerianum* Nash, Bull. Torr. Bot. Cl. xxii. 421 (1895).

P. OLIGOSANTHES, var. **Helleri** (Nash), comb. nov. *P. Helleri* Nash, Bull. Torr. Bot. Cl. xxvi. 572 (1899).

Typical *Panicum oligosanthes* Schultes (1824), as interpreted by Hitchcock & Chase, is the plant of the southeastern Coastal Plain (but extending in the interior northward to Lake Michigan) with linear-lanceolate primary leaves mostly under 8 mm. broad and spikelets commonly 3.5–4 mm. long. Northward and westward it is represented by a plant of quite similar character (*P. Scribnerianum*) but with the primary leaves usually more lanceolate and slightly broader (up to 12 mm.) and the spikelets slightly shorter (usually under

3.5 mm. long); and southwestward the two pass by insensible transitions into *P. Helleri* which is commonly glabrous or appressed-pubescent, as in *P. oligosanthes*, thinner-leaved than in most material of the others, and with spikelets as small as in *P. Scribnerianum.*

That *P. oligosanthes*, *P. Scribnerianum* and *P. Helleri* are not truly segregated species, in the sense used by most conservative taxonomists (such indubitable species, for instance, as *P. verrucosum* Muhl., *P. depauperatum* Muhl., *P. microcarpon* Muhl., *P. dichotomum* L. (including *P. barbulatum* Michx.), *P. lucidum* Ashe, *P. xanthophysum* Gray, etc.) is made sufficiently clear by the very illuminating critical comments of Hitchcock & Chase regarding them. Their key does not sharply contrast the first with the other two, for that is separated from them and from *P. Wilcoxianum* (from which I am unable to distinguish *P. Deamii* Hitchc. & Chase in Deam, Grasses of Indiana, 283, 284, t. 75 and fig. 18) on evasive shape of spikelets, shade of green of the plants and direction of trichomes.

Spikelets narrowly obovate, subacute; plants olivaceous, appressed-pubescent.....172. *P. oligosanthes.*
Spikelets broadly obovate, turgid, blunt; plants green, pubescence, if present, not appressed.
Blades [etc.].....168. *P. wilcoxianum.*
Blades ascending or spreading, rarely less than 8 mm. wide, usually wider; plants not hirsute throughout.
Spikelets 3.2 to 3.3 mm. long; blades firm; sheaths or some of them more or less hispid.....171. *P. scribnerianum.*
Spikelets not over 3 mm. long; blades rather thin; sheaths or some of them glabrous or sparsely hispid. 170. *P. helleri.*

The key itself, when carefully checked, is sufficient indication that the quality ascribed to the blades of *P. Helleri* extends to the whole series of differential characters. Starting with the spikelets, the "narrowly obovate [*i. e.* obovoid], subacute" spikelet of the type of *P. oligosanthes* is illustrated by Hitchcock & Chase as their fig. 321; the "broadly obovate [obovoid], turgid, blunt" spikelet of the type of *P. Helleri* in their fig. 317. The very close similarity of outline of spikelets in figs. 317 and 321 is doubtless due to the facts that the autumnal state of *P. oligosanthes* has "spikelets . . . . commonly more turgid and blunt"; that some specimens of *P. oligosanthes* "appear to be intermediate between this and *P. scribnerianum*, having the narrow blades, appressed pubescence, and open, few-flowered panicles of *P. oligosanthes*, but very turgid, blunt spikelets, which, however, measure 3.5 to 3.7 mm. long"; and that in some

specimens of *P. Hellcri* "The spikelets are 3 mm. long, too immature to show turgidity."

As to length of spikelets, the very definite statements in key and diagnoses need emendation. *P. oligosanthes* by the diagnosis has "spikelets 3.5 to 4 mm. long," but "In this species the spikelets vary more in size than usual in this group. The following specimens have spikelets only 3.2 to 3.3 mm. long." This is the exact size given in the key and the diagnosis for *P. Scribnerianum;* but in "A few Mississippi specimens" of the latter Hitchcock & Chase find "spikelets 3.2 to 3.6 mm. long." Spikelets 3.6 mm. long are the rule at the northeastern limit of the species, in southwestern Maine and southern New Hampshire (South Berwick, Me., *Parlin & Fernald;* York, Me., *Fernald & Long,* no. 12,547; Walpole, N. H., *Fernald,* no. 280); and upon such material from Massachusetts the range of reputedly true *P. oligosanthes* has been extended to the northeastern limit of *P. Scribnerianum* (see Hubbard, Rhodora, xv. 64). Furthermore, although *P. Hellcri* has the "Spikelets not over 3 mm. long," in "a few specimens . . . . the spikelets are 3.1 to 3.2 mm. long; and *Hitchcock* 1233, with spikelets 3.3 mm. long, is referred here since the specimen shows the sprawling habit of *P. hellcri.*" *P. oligosanthes,* which, as above shown, may, likewise, have the "spikelets only 3.2 to 3.3 mm. long," has the autumnal state "erect or spreading, sometimes topheavy-prostrate." The specific differentiation now seems to hang on the distinction between "sprawling" and "topheavy-prostrate." I give up!

As for the difference between "olivaceous" and "green," again I give up. The New England plant (*P. Scribnerianum*) is surely not a deep green, but rather pale. In the garden the depth of green in many plants is much altered by the increase or diminution of nitrates; *P. oligosanthes* and other species (*P. xanthophysum,* for instance) growing in open sterile sands and gravels are far less green than when they occur in richer soils. Unless supported by morphological characters, such differences in depth of green are not specific.

In the "appressed-pubescent" *P. oligosanthes* the diagnosis calls for "the papillose pubescence ascending," but in many of the specimens it diverges at an angle of 60°, while in some it is almost horizontally spreading. In *P. Hellcri* with "sheaths or some of them glabrous or sparsely hispid," as opposed to *P. Scribnerianum* with "some of them more or less hispid," "little weight can be given to pubescence or lack

of it"; while *P. Scribnerianum* "is very variable in the matter of pubescence. . . . Glabrous and hispid sheaths are commonly found on the same specimen."

Ordinarily *P. oligosanthes* and *P. Scribnerianum*, growing in open sandy or rocky soil, have the firm leaves of ordinary xerophytic colonies of plants, while some of the woodland specimens of *P. Helleri* have them thinnish. Specimens of the latter species, however, such as *Bush*, no. 3893, *Hitchcock*, no. 1173, *Reverchon*, no. 2854 and *Bush*, no. 5399, growing in the open, have firm enough foliage; and in tracing *P. Scribnerianum* to its nomenclatural source (*P. scoparium* of Gray, Man. 613, not Ell.) Hitchcock & Chase designated "as the type of *P. scribnerianum*" a plant from Pennsylvania collected by John Carey in 1836. The type of *P. Scribnerianum* has leaves as thin as in the most extreme *P. Helleri*.

It is quite unnecessary to amplify by further illustrations from abundant intergradient specimens the clear demonstration supplied by the critical comments of Hitchcock & Chase, that *P. Scribnerianum* and *P. Helleri* are not specifically separable from *P. oligosanthes*. By treating them as "species" on a par with innumerable true and constant species one of the simplest and most fundamental principles of evolution and of sound taxonomy is obscured.

P. COMMUTATUM Schultes, var. **Ashei** (Pearson), comb. nov. *P. Ashei* Pearson in Ashe, Journ. Elisha Mitchell Soc. xv. 35 (1898), excluding synonym.

In their extremes *P. commutatum* and *P. Ashei* appear very different: such extremes, for instance, as the narrow-leaved stiff *P. Ashei* with wiry, slender culms grayish-puberulent, which abounds in southern New England, New York and New Jersey, appearing utterly unlike the coarser, large-leaved, glabrous plant of Florida and other southern states, true *P. commutatum*. Similarly, the firm-leaved and erect *P. commutatum* of open habitats, with comparatively pale foliage, looks, at first glance, amazingly unlike the weak and often depressed or reclining, thin- and dark-green-leaved plant of southern swamps and wet woods, which has been separated as *P. Joorii* Vasey, U. S. Dept. Agr. Div. Bot. Bull. 8: 31 (1889); but prolonged study of the plants referred by Hitchcock & Chase to these three categories and close checking of the variability of the characters emphasized by them and shown by abundant specimens fail to reveal the clear lines which we have learned, through years of experience, to look for in

true species. *P. Joorii* seems like *P. commutatum* venturing from the open sands and dry open woods into the rich southern swamps or wet woods and there displaying the simple edaphic responses which one would expect in such a habitat: deeper-green, thinner and more spreading leaves and weaker habit. I am unable to find in the material that striking asymmetry of leaf which is so emphasized by Hitchcock & Chase as to become one of their key-characters. A very slight asymmetry sometimes occurs but similar asymmetrical foliage can easily be found on sheets of *P. commutatum* from the drier open habitats and of *P. Ashei*. To me *P. Joorii* is a weak and thin-leaved state of *P. commutatum;* and *P. Ashei* is a well defined but by no means constant variety which ranges generally more to the north than does true *P. commutatum*. In the latter decision I find myself heartily in accord with the conclusion of Scribner & Merrill in their very sound and satisfying study of *The New England Species of the Genus Panicum*[1] published in 1901, though I would unhesitatingly admit *P. Ashei* as a good geographic variety. Scribner & Merrill reduced outright *P. Ashei* to *P. commutatum*, but they qualified the reduction by the note: "In the type [true *P. commutatum*] the culms are glabrous as are the nodes, but in the form which extends into New England ranging southward to Tennessee and Florida the culms, at least the lower internodes, are puberulent and the nodes often quite densely pubescent with erect, appressed hairs."[2] On characteristic New England sheets of *P. Ashei* they recorded, at that time, their conviction as follows: "*Panicum Ashei* Pearson, a form or var. of *P. commutatum* Schultes."

Turning to the extended treatment by Hitchcock & Chase we find the most significant differences, as recognized by them, in the key:

Culms crisp-puberulent; blades usually rigid, symmetrical, rarely over 10 mm. wide; spikelets about 2.5 mm. long.....183. *P. ashei.*
Culms glabrous or softly puberulent; blades firm or lax; spikelets 2.7–3.2 mm. long.
  Culms erect, or autumnal form leaning; blades symmetrical, broadly cordate.....184. *P. commutatum.*
  Culms decumbent; blades usually asymmetrical and falcate, narrowed to the scarcely cordate base.....186. *P. joorii.*

Turning to the fuller discussions by Hitchcock & Chase we find their key-characters modified. The spikelets of *P. Ashei* become "2.4–2.7 mm. long," though in "Occasional specimens . . . . only 2.1–2.3 mm. long"; and the type has the leaves "less rigid than usual."

[1] Scrib. & Merr., Rhodora, iii. 93–129 (1901).
[2] Scrib. & Merr. l. c. 116, 117 (1901).

The term *rigid* is pretty strong for a leaf which is easily bent by merely poking it against a neighboring object; and when the New England plant grows in the shade its leaves are thin and submembranaceous.

In the full description of *P. commutatum* the spikelets are defined as "2.6–2.8 mm. long," not very much larger than the "2.4–2.7" of *P. Ashei;* but "Most of the Florida specimens . . . . have . . . . spikelets 3 to 3.2 mm. long. This form can not be satisfactorily separated even as a subspecies, though extreme specimens differ sufficiently to be recognizable." In *P. Joorii* the spikelets are described as "3 to 3.1 mm. long," which should keep it apart from *P. Ashei,* but, unfortunately, there are some "doubtful" "specimens with spikelets only 2.2 to 2.5 mm. long."

As to the culms, *P. commutatum* "is typically almost glabrous, . . . but puberulence occurs rather commonly and is not found to be associated with any other character. . . . Some puberulent specimens have ordinarily wide blades and other specimens with wide blades are glabrous." Similarly with *P. Joorii:* "As a whole this species has glabrous culms, sheaths and blades, but occasional specimens more or less puberulent are found."

Although the leaf-blade of *P. commutatum* is said in the key to be symmetrical as opposed to the "usually unsymmetrical" blade of *P. Joorii,* it seems that in *P. commutatum* the "Early autumnal specimens . . . sometimes appear very different from vernal specimens, owing to the somewhat unsymmetrical broadening of the middle of the crowded upper blades."

Furthermore, "A few southwestern specimens . . . differ in appearance from *P. commutatum* . . . . and seem to approach *P. joorii,* but the spikelets are not over 2.8 mm. long." In *P. Joorii,* nevertheless, as pointed out in a preceding quotation, they may be as short as 2.2 and as long as 3.1 mm.

Although Hitchcock & Chase find *Panicum Ashei* an "unusually uniform species," it should be apparent from the contradictory statements above quoted that it belongs to that large group of so-called "species," very much favored by some of our American botanists, in which stability of characters is not required: the geographically somewhat segregated tendencies which I believe in calling geographic varieties.

On July 23, 1895, the late Thomas C. Porter collected at Chestnut

Hill, Easton, Pennsylvania, the freely branching late-summer or autumnal state of a plant which he called *P. commutatum;* the next June, on the 5th, he collected the same plant at Chestnut Hill in the vernal state, with simple culms and well developed terminal panicles. The two collections look as if they were from the identical colony; both have ashy-puberulent culms and submembranaceous leaves mostly 1–1.5 cm. wide, the larger of the primary ones 57–63-nerved. The collection of July 23 (in the Gray Herbarium) is labelled by Hitchcock & Chase as unquestioned *P. Ashei;* the material of it in the vernal stage (June 5) as *P. commutatum.* The plants, to be sure, are embarrassing, for they have the puberulence of *P. Ashei,* with the leaves overstepping the prescribed limit of 10 mm. They belong in the *intermediate* group, a status likewise shown by the number of veins in the larger leaves. I have been over the better-marked plants of *P. commutatum* of the South and the clearly defined *P. Ashei* of the North and find that in the larger leaves of the former the nerves count up to 53–99, while in *P. Ashei* they range from 31–61. The Chestnut Hill material, which is authoritatively placed in both species, shows a count of nerves too near the border-line. Another Pennsylvania sheet, *Heller,* no. 4780, collected in Lancaster County, June 5, 1901, is cited in the *North American Species of Panicum* as perfectly good *P. Ashei.* Nevertheless, the specimens of this no. in the Gray Herbarium, specially renamed by Hitchcock & Chase *P. Ashei* (probably because of puberulence on the lower internodes), show plenty of leaves 1.8–2 cm. broad.

If there is any clearly recognizable difference between the kinds of puberulence emphasized by Hitchcock & Chase ("Culms crisp-puberulent" in *P. Ashei;* "glabrous or softly puberulent" in *P. commutatum*) the soft puberulence or short pilosity is well displayed in *Bush,* no. 410, from McDonald Co., Missouri. The leaves of this no. (as represented in the Gray Herbarium) are 7–11 mm. wide; consequently it was relabelled "*P. Ashei.*" But the "softly puberulent" lower internodes and the 75 nerves of the leaves remove it technically from that "species" as defined.

It is unnecessary to multiply cases of the break-down of characters: there are before me a score or more of other examples and they include quite inseparable collections called sometimes *P. commutatum,* sometimes *P. Joorii:* for instance *Harper,* no. 1623, from Brooks Co., Georgia and *Nash,* no. 1675, from Lake Co., Florida, both cited as *P.*

commutatum; while *Hitchcock*, no. 477, from Alva, Florida and looking as if unretrievable if it became mixed with the other two, is cited as *P. Joorii*. Both identifications seem correct and they reemphasize the lack of specific differences between *P. Joorii* and *P. commutatum*.

A NEW SPECIES OF EUPHRASIA FROM NORTHWESTERN CANADA

Hugh M. Raup

(Plate 278)

Euphrasia subarctica sp. nov. Planta 2–14 cm. alta; caulis gracilis, raro ramosus, atropurpureus, albo-pilosus, internodiis inferioribus 1–2.5 cm. longis, et ramis brevibus divergentibus. Folia et bracteae glabra, vel tenuiter scabra praecipue ad margines, 7 mm. longa plerumque breviora crasse dentata 3–4 dentibus acutis aristatis; folia inferiora apice obtusa vel rotundata. Flores in axilli plurimorum foliorum, conferti ad apicem caulis. Corolla 3–3.5 mm. longa; labium superius bilobatum, inferiore brevius; lobi laterales labii inferioris divergentes, medio angustiores; lobi emarginati vel undulati, basi flavescentes, ad apicem violacei, medio linea notati. Capsula oblongo-obovata, retuso-acuminata, calycis dentes aristatos aequans.

Plant 2–14 cm. high; stem slender, rarely branched, blackish purple, white-pilose, with the lower internodes 1–2.5 cm. long, and with branches short and spreading. Leaves and bracts glabrous or sparingly scabrous especially toward the margins, 7 mm. long, usually less, coarsely dentate with 3–4 teeth, the teeth acute and aristate-tipped, the apex of the lower leaves usually obtuse or rounded. Flowers borne in the axils of most of the leaves, gradually crowded toward the apex of the stem. Corolla 3–3.5 mm. long, upper lip bilobed, shorter than the lower, the lateral lobes of the lower lip divergent, narrower than the middle lobe; the lobes emarginate or undulate, yellowish at the base, violet toward the apex, with a greenish median line. Fruiting capsule oblong-obovate, retuse-acuminate, as long as the aristate calyx-lobes.—Damp crevices in shore rocks just east of Sand Pt., Lake Athabaska, Sept. 6, no. 4633 (TYPE). With flowers and maturing capsules. Specimens collected in "brush-land and open woods, near Fairbanks, Alaska," by *L. F. Henderson*, Aug. 2, 1932 (no. 15118) have also been studied and found to match the type material very closely.

The strongly bilobed upper lip of the corolla and the aristate toothing of the leaves place this plant clearly with *E. arctica* and *E. hudsoniana*, but its small flowers (3–3.5 mm.) immediately distinguish it from these and their relatives. Further, it differs from *E. hudsoniana*

in having the rare branches short and spreading instead of long and erect, much smaller bracts (less than 7 mm. long), corolla-lobes yellowish at the base with a median greenish line instead of "whitish with pale violet lines," and the lateral lobes of the lower lip more divergent. From *E. arctica* it differs also in having the teeth of its bracts aristate instead of merely acute. The writer is indebted to Professor M. L. Fernald for first calling his attention to the outstanding characters which set off this species.

Arnold Arboretum,
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Explanation of Plate 278

Fig. *1*, Euphrasia subarctica, ¾ natural size; fig. *2*, upper stem-leaves and flowers, 3 × natural size; figs. *3*, *4*, side and top views of flower, about 10 × natural size.

Apios americana Med.—Though *Apios americana* is cited correctly in Index Kewensis as published by Medikus in 1787 in Vorles. Churpf. Phys.-oekon. Gesellsch. II. 355, thus showing clearly that the name has priority over *Apios tuberosa* Moench. Meth. 165 (1794), the binomial *Apios americana* does not seem to have been adopted by any author, American or foreign. The only mention I find is by Taubert in Engler & Prantl, Nat. Pflanzenfam. III.—3, p. 365 (1894) who says under *Apios:* "5 Arten, davon *A. tuberosa* Mnch. und *A. americana* Med. in Nordamerika," apparently assuming that these names represent different species, since both appear in Index Kewensis as valid species. The reason for the neglect of this name is without doubt the great rarity of the periodical in which Medikus published *Apios americana*. It cannot be found in any American library, but there is a copy of Vorlesungen der Physikalisch-oekonomischen Gesellschaft, published in 5 volumes from 1784–1789, in the British Museum (Natural History) which I consulted last year when in London. Through the kindness of Dr. J. E. Dandy I have before me an exact copy of the description of *Apios* and *Apios americana* which is one of the 108 genera of Leguminosae treated by Medikus in a paper entitled "Versuch einer neuen Lehrart." The genus which is usually credited to Moench (1794) is well characterized by Medikus and there is also a full description of *A. americana* with the citation of *Glycine Apios* L. as a synonym. The generic name is cited by Medikus as "*Apios* Corn." and in turning to Cornut one finds in his Canaden-

Euphrasia subarctica: fig. 1, × ¾; fig. 2, × 3; figs. 3 and 4, flower from side and top, × 10.

sium plantarum historia (1633) on p. 200 a description and good figure of the plant under the name *Apios americana*, the very name which Medikus adopted. The synonymy of the plant now stands as follows:

Apios americana Medikus in Vorles. Churpf. Phys.-oekon. Gesellsch. II. 355 (1787).—*Glycine Apios* Linnaeus, Sp. Pl. 753 (1753).—*Apios tuberosa* Moench, Meth. 165 (1794).—*Apios Apios* Macmillan in Bull. Torr. Bot. Club XIX. 15 (1892). The generic name should be cited as *Apios* Medikus, l. c. 354 (1787).

The genus will be proposed as a nomen conservandum against *Bradlea* Adans. (1763) which includes *Apios* Med., *Wisteria* Nutt. and *Glycine* L., but which by most authors has been treated as a synonym of *Apios*.—Alfred Rehder, Arnold Arboretum.

Prunus virginiana, forma leucocarpa in New Brunswick.—On August 14, 1933, a clump of chokecherry bushes bearing light yellow fruit was observed near the Dominion Entomological Laboratory, Fredericton, New Brunswick. Gray's "Manual" records this yellow-fruited shrub as *Prunus virginiana* L. var. *leucocarpa* Wats., but Professor M. L. Fernald, to whom a specimen was sent, has kindly pointed out that the correct name is *P. virginiana*, forma *leucocarpa* (Wats.) Haynie and that it has not been recorded from Canada. Further search has brought to light the presence of several other similar clumps in the immediate vicinity. The location is on the west side of the St. John, about one-half mile from the river, on a gentle slope.

Further collecting will possibly show that the yellow-fruited form is present in other localities in the St. John Valley.—C. E. Atwood, Department of Agriculture, Fredericton, New Brunswick.

SOME CRITICAL PLANTS OF GREENLAND[1]

M. L. Fernald

(Plates 279 and 280)

The remarkable series of plants, consisting of thousands of beautifully prepared specimens collected on the Crocker Land Expedition by Dr. W. Elmer Ekblaw, was recently presented by the American Museum of Natural History to the Gray Herbarium. The detailed

[1] Published with aid to Rhodora from the National Academy of Sciences.

report upon his botanical studies in the northwestern corner of Greenland is being published elsewhere by Dr. Ekblaw, but it seems important to publish at this time a few nomenclatural and taxonomic items. These have been supplemented by notes on a recent collection received from Dr. Porsild.

Deschampsia brevifolia R. Br. Suppl. App. Parry's Voyage, 291—mispaged 191—(1824).[1] *Aira arctica* Spreng. Syst. iv.[2] (Curae Post.), 32 (1827), a renaming of *D. brevifolia* R. Br. (1824) presumably on account of the earlier and distinct *A. brevifolia* Pursh, Fl. Am. Sept. 76 (1814) and another *A. brevifolia* Bieb. Fl. Taur. Cauc. iii. 63 (1819); Trin. Mém. Acad. St. Pétersb. VI. Sci. Math. Phys. Nat. i. 56 (1831). *A. cespitosa*,[2] var. *brevifolia* (R. Br.) Trautv. Acta Hort. Petrop. i. 86 (1871), not Hartm. Scand. Fl. ed. 2: 25 (1832). *D. arctica* (Spreng.) Merr. Rhodora, iv. 143 (1902); Ostenf. Medd. Grønl. lxiv. 167 (1923). *A. cespitosa*, var. *arctica* (Spreng.) Simmons, Rep. 2nd Norweg. Arct. Exp. Fram 1898–1902. No. 2: 173, t. 9, fig. 7 (1906). *Poa evagans* Simmons, l. c. 165, t. 8, figs. 2–7 (1906), acc. to Ostenf. l. c. 168 (1923).

It will be noted that Merrill in 1902 and, later, Ostenfeld (in 1923) independently called *Deschampsia brevifolia* R. Br. (1824) *D. arctica*, based on *Aira arctica* Spreng. (1827) or Trinius (1831), because there had been species called *Aira brevifolia* prior to the publication of *Deschampsia brevifolia* by Robert Brown. Since, however, neither the *Aira brevifolia* Pursh (1814) nor the *A. brevifolia* Bieb. (1819) had been transferred to Deschampsia, *D. brevifolia* R. Br. is the correct name of the species under that generic name. If, however, the dwarf arctic species is treated as *Aira*, the situation becomes reversed, for it cannot be called *A. brevifolia* because of the earlier homonyms; it would then have to be *A. arctica* Spreng.

[1] Merrill, Rhodora, iv. 143 (1902), says p. 291 and gives the date of issue as 1821; *Index Kewensis* gives the page as 191. The account of Parry's 1st voyage was published in 1821 but the copy at the Gray Herbarium does not contain the botanical Supplement. *A Supplement to the Appendix of Captain Parry's Voyage for the Discovery of a North-West Passage, in the Years 1819–20, containing an account of the Subjects of Natural History* was published by John Murray in 1824. This supplement, containing Appendix xi. Botany or *A list of Plants, collected in Melville Island . . . with . . . Descriptions of the new Species*, by Robert Brown, F. R. S. and L. S., has an "Advertisement" signed by W. E. Parry, London, December, 1823, specially expressing his regret that it " had not yet been completed."

As to the paging, the copy before me is correctly paged from cclxii to cclxxxii; but from page cclxxxiii to ccxcviii the 1st c was omitted, after which the paging correctly continues as ccxcix, ccc, ccci, etc. The misnumbering is evident.

[2] Linnaeus clearly called his species *Aira cespitosa*. It is needless to alter his spelling to *caespitosa*, as is commonly done; the original spelling was correct and no change is justified by the International Rules. The same trivial name under other genera was repeatedly spelled by Linnaeus *cespitosa*.

Carex misandra R. Br., forma **flavida**, f. nov., a forma typica recedit squamis perigyniisque flavescentibus.—Greenland: seepage swale along small stream, Etah, lat. 78° 20′ N., long. 72° 30′ W., July 30, 1915, *W. Elmer Ekblaw* of the Crocker Land Expedition, no. 201 (type in Gray Herb.).

C. misandra, forma *flavida*, departing from the common arctic *C. misandra* (with purplish-black or castaneous spikes) in its very pale tone, is a color-form which sooner or later was likely to be found. Such extremes, with pale instead of purple-black or castaneous spikes, have already been noted in most of the related species: *C. nivalis* Boott, forma *cinnamomea* (Boott) Kükenth.; *C. atrofusca* Schkuhr, forma *flavescens* Kükenth.; *C. Banksii* Boott, forma *ochrostachya* (Phil.) Kükenth.; *C. frigida* All., forma *flavescens* Christ; and *C. fuliginosa* Schkuhr, forma *ochrostachys* Schur.

Carex anguillata Drejer, Revis. Caric. Bor. 36 (1841); Lange, Fl. Dan. xvi. fasc. xlviii. 11, t. mmdcccxlvi (1871); Pease, Rhodora, xxxii. 258 (1930).

A sheet of material sent by Dr. Morten P. Porsild, collected in southern Greenland (Amitsarssûp Qingua, Agdluitsoq-Fjord, 60° 45′ N., July 31, 1925, *A. E. & M. P. Porsild*) as a possible hybrid of *Carex Goodenowii* and *C. rigida*, is, except for its taller stature, a very satisfactory match for the Flora Danica plate of Drejer's species from Iceland. *C. anguillata*, treated by Kükenthal as a minor form of *C. rigida*, as *C. rigida*, forma *anguillata* (Drejer) Kükenthal, in Engler, Pflanzenr. iv[20]. 302 (1909), is certainly an extreme development on account of its very slender perigynia and narrow scales. It is not quite satisfactory to accept, without more study, Kükenthal's disposition of it. Incidentally, the name *C. rigida* Good. (1801) is antedated by *C. rigida* Schrank (1789); the earliest available name for the common boreal *C. rigida* Good. seems to be *C. concolor* R. Br. in Parry, Voyage, App. 283 (1824).

As indicated by Pease in the note cited, *C. anguillata* has been found outside Iceland, whence it was described, in northern Labrador, northern Ungava and on the northwest side of Hudson Bay; Pease added a station on Mt. Katahdin in Maine. It was, then, quite to be expected that the plant would be found in southern Greenland. The colony of *C. anguillata* on Mt. Katahdin could hardly have originated as a cross of *C. concolor* and *C. Goodenowii*, for in Maine the latter species is confined to the lowest altitudes and chiefly to the coast. The absence of *C. Goodenowii* from the more northern

regions of Labrador and Canada, where *C. anguillata* has been collected, also militates against the latter having had the origin suggested on Porsild's label. Further study of the plant is needed to determine whether it is a good species or a rather marked variety of *C. concolor.*

Juncus subtilis E. Meyer, Synop. Luzul. 31 (1823); Fernald, Rhodora, iii. 228 (1901); Brainerd, Rhodora, iv. 128 (1902); Buchenau in Engler, Pflanzenr. iv[36]. 168, fig. 85 (1906); Rob. & Fern. in Gray, Man. ed. 7: 275, fig. 587 (1908); Britton in Britt. & Brown, Ill. Fl. ed. 2, i. 476, fig. 1195 (1913). *J. fluitans* Michx. Fl. Bor.-Am. i. 191 (1803); Laharpe, Mon. Jonc. 135 (1827); not Lam. (1789). *J. uliginosus,* β. *subtilis* (E. Meyer) Hook. Fl. Bor.-Am. ii. 191 (1838). *J. pelocarpus,* var. *subtilis* (E. Meyer) Engelm. Trans. St. Louis Acad. ii. 456 (1866), 497 (1868). *J. pelocarpus,* var. *fluitans* (Michx.) Buchenau, Mon. Junc. 283 (1890).

For some years the Atlantic European and Atlantic American (southeastern Newfoundland; Sable Island, Nova Scotia) *Juncus bulbosus* L. (*J. supinus* Moench) has appeared in enumerations of Greenland plants. Until very recently, however, I have been unable to learn upon just what plant the Greenland records rest, a point which has been of peculiar interest to settle in view of the very characteristic Atlantic range of the species: "Europe, Algeria, Tunis, Madeira and the Azores"; also southeastern Newfoundland and Sable Island, and very doubtfully in Massachusetts.[1] This range, temperate Europe and northern Africa on the one hand, southeastern Newfoundland and Nova Scotia on the other, with or without intermediate Macronesian stations, is so typical and now so well known, that a departure from it, by an occurrence in Greenland, is, to say the least, worth investigating.

It is gratifying, therefore, to receive from Dr. Porsild very characteristic material of the Greenland plant. The nine numbers before me were all collected well up the western coast of Greenland (between 64° 30′ and 70°). They are all sterile, but some of them bear the very characteristic (in fact, thoroughly distinctive) axillary propogating buds which at once show them to be, not the European-Newfoundland *J. bulbosus,* but the strictly North American *J. subtilis* E. Meyer.

Although this is as it should be, the local plant of western Greenland American, rather than European, it is particularly noteworthy that as yet *J. subtilis* is not known in America from north of lat. 51°.

[1] Fernald, Rhodora, xxxiv. 117 (1932); see also Buchenau in Engler, Pflanzenr. iv[36]. 175. (1906).

The number of species of western Greenland which with us do not extend far north of lat. 51°–53° is very extensive. A detailed study of this relationship now progressing indicates it for a fair proportion of the Greenland flora. For the present it is sufficient to refer to a brief discussion already published, with special note of *Galium triflorum*, *G. palustre*, *Utricularia intermedia*, *Subularia aquatica* and *Callitriche hermaphroditica*.[1]

The two species of *Juncus* here discussed are so typical of considerable floras that I am appending a map of their very distinctive ranges,

Map 1. Range of Juncus bulbosus (1); of J. subtilis (2).

J. bulbosus in the larger, chiefly European area (1), *J. subtilis* in the smaller (2).[2]

Ranunculus pedatifidus J. E. Sm., var. leiocarpus (Trautv.) Fern., Rhodora, xix. 138 (1917). *R. affinis* R. Br. in Parry, 1st Voy. Suppl. App. 265 (1824). *R. affinis*, var. *leiocarpus* Trautv. in Middendorf, Reise in Sibir. i. 62 (1847).

The decisions of Dr. Britton[3] and, later, of Dr. K. C. Davis[4] and of

[1] See Fernald, *Persistence of Plants in Unglaciated Areas*, etc., Mem. Am. Acad. xv. 319–321 (1925).

[2] The map is made on Goode's Polar Equal Area Projection, no. 201 Pc. copyrighted and published by the University of Chicago Press. Supplementary specimens loaned by Dr. Porsild show the species south to lat. 64° 30′ in Greenland and north to lat. 70°.

[3] Britton, Bull Torr. Bot. Cl. xviii. 265 (1891).

[4] K. C. Davis, Minn. Bot. Stud. ii. 482 (1900).

myself that *Ranunculus affinis* is conspecific with *R. pedatifidus* is not acceptable to the Scandinavian botanists, who continue to call the circumpolar arctic-alpine species (Arctic America, Greenland, Arctic Eurasia, south along the Rocky Mts. to New Mexico, in the Hudson Bay area, in northwestern Newfoundland and on the Altai) *R. affinis*. In his Vascular Plants of Ellesmereland, Simmons gives in great detail his conclusion from studying his Ellesmereland material and the type material of *R. pedatifidus*. In his discussion of *R. affinis* he says (I can here quote only short passages from the 6-page, detailed discussion):

It has been rather troublesome to ascertain which name the plant here in question should rightly bear. For a time I was inclined to think that it might be the *R. pedatifidus* of Smith. . . This seemed the more probable, as an american author . . . had adopted that name. But, during my stay in London, I had occasion to see the original description as well as the specimens in the Linnaean herbarium from which it was made. . . There are in the herbarium of Linnaeus, four individuals which doubtless belong to the same collection. On the paper is written in the handwriting of Smith himself: "R. pedatifidus Sm. in Rees' Cyclop. no. 72," and at one point there is a sign*,[1] which seems to be older than the label of Smith and here is added "Siberia" (in pencil by Smith).

Now the original specimens, as well as the description, show that Smith has had in view, a plant very nearly allied to that which Brown soon after described from Melville Island. There are, however, some differences, that seem sufficient to separate the latter plant from that of Smith. The characters that especially separate *R. pedatifidus* from *R. affinis* are: the almost circular circumference of its basal leaves, that are very deeply cut in a great number of very narrow, or almost entirely linear, segments, with obtuse points, evidently grouped after a pedate design, with a smaller middle, and two larger lateral, main lobes. The middle lobe is only equipped with two lateral secondary lobes halfway from the base, and these show a tendency to be again cleft. The lateral lobes are deeply cut into at least three or four secondary lobes, that only cohere a little above the basis, and are again deeply cleft. The leaf is thus formed of a great number of narrow, or almost filiform, segments. The basal leaves are more or less equipped with sparse white hairs. The stem leaves are sessile or have a very short peduncle. The lower ones resemble the basal leaves, but their segments are longer, do not stand so close together, and become fewer in the upper leaves, finally being only three. The sheath of the stem leaves half-embracing, not so white-membraneous as in *R. affinis*. The plant is smaller and more slender in all parts, the flowers are not inconsiderably smaller. The white hair-covering of the stem is more prominent, and not reduced only to the parts immediately below the insertions of the leaves. Especially the part of

[1] Simmons here mistook for an asterisk the symbol between the two specimens which, Mr. Pugsley informs me, "indicates that it came from Siberia and was communicated by Gmelin." This and the other signs used by Linnaeus were explained by the late Dr. B. Daydon Jackson in his Index to the Linnean Herbarium, 19 (1912).

the stem below the lowest leaf is hairy. The flower-stalk is, in the dried specimens at least, prominently canaliculate.

The true *R. pedatifidus*, Sm. is, as far as I know, only found in Asia, especially in Eastern Siberia and also in the islands of the Bering Sea.

. . . . . .

I think, however, that a new description, formed after my Ellesmereland specimens, may not be out of place.

R. affinis: perennis, plus minusve caespitosus, caule 15–25 cm. alto, glabro vel pilis parcis, subadpressis, brevisque, inferne longioribus, obsito; folia basalia longe petiolata, vaginis latis, membranaceis, albis, instructa, semper profunde pedatifida, petiolis parce pilosis; folia caulina brevissime petiolata vel sessilia, late membranaceo-vaginata, marginis vaginae pilis longis albis instructis, pedato-multifida, lobis 5–9 angustis, acutiusculis; flos 2–3 cm. latus; sepala purpurascentia, parce pilosa, petalis dimidio breviora; petala flava, violaceo-nervata, obovata; torus cum carpellis per anthesin ovatus, postea cylindraceus; achenia parce pilosa, rostro brevi recurvo.

. . . . . .

The only time I found this species, August 8, 1900, it bore flowers as well as fruit in all stages abundantly.[1]

The series to which *R. pedatifidus* and *R. affinis* belong is most difficult and the intricate relationships and interrelationships can not satisfactorily be resolved in a single limited herbarium nor on the basis of knowledge of variation gained from a single field-experience. One of the type sheets of *R. pedatifidus* has been photographed through the great kindness of Dr. H. K. Svenson, who, while in London arranged with Mr. R. G. Pugsley at the Linnean Society for the photographing of it. This photograph (PLATE 279) shows the basal leaves more uniformly, deeply and numerously divided than in most of the Arctic plant. The original specimens, collected in Siberia by Gmelin, are very closely matched by the equally beautiful material (PLATE 280, FIG. 1) collected on Mt. Sinjucka in the Altai by Krylov on May 22, 1901, and originally called *R. affinis* R. Br., but later changed to *R. amoenus* Ledeb.

Although this Siberian (Altai) plant, true *R. pedatifidus*, is not absolutely matched by American material, its only sharp difference, so far as I can make out from the photograph of the Gmelin material (the type) and from the Krylov sheet, is the more uniformly dissected foliage. Many North American and Greenland specimens are as pubescent; the sepals and their minute pilosity are closely matched by those of several Arctic American specimens and the carpels (in the Krylov material) are not, to me, different. In North America

[1] Simmons, Vasc. Pl. Ellesmereland. Rep. Second Norg. Arctic Exped. "Fram" 1898–1902. No. 2: 101–107 (1906).

the plant varies excessively in foliage, just as do many other species of the group. In the Rocky Mountain area the basal leaves may be very similar (PLATE 280, FIG. 2) to those of Smith's type or they may be uncleft, *R. pedatifidus*, var. *cardiophyllus* (Gray) Britton. Eastward and in the Arctic the uncleft leaves are rare, but most of the basal leaves are less cleft than in the Asiatic type. So complete a series (PLATE 280, FIGS. 2–4), however, can be built up from specimens of North America (including Greenland) that I am at a loss to find anything more than geographic varieties, certainly not distinct species, among these plants. The Ellesmereland plant was beautifully illustrated by Simmons (his plate 4, figs. 2–5) and, although he states that *R. pedatifidus* "is smaller and more slender in all parts, the flowers not inconsiderably smaller," his plate (× ½) does not well sustain this differentiation. In unfavorable situations such as those of the type-collection (PLATE 280, FIG. 4) of *R. affinis*, it may mature with a total height of a few centimeters; in more favorable environment, it may be 4 dm. high, but without change of the morphological characters. Until it is more convincingly demonstrated than has yet been done that *R. affinis* and *R. pedatifidus* are specifically distinct, I am compelled to consider them two geographic varieties of a very polymorphus circumpolar species.

ARNICA ALPINA (L.) Olin, var. **angustifolia** (Vahl), comb. nov. *A. angustifolia* Vahl, Fl. Dan. ix. fasc. xxvi. 3, t. mdxxiv (1816). *A. montana*, β. *angustifolia* (Vahl) Hook. Fl. Bor.-Am. i. 330 (1834), at least as to name-bringing synonym.

Although very close to the Lapland *A. alpina*, the plant of Greenland and adjacent regions differs almost consistently in the shorter teeth of the ligules. In the Scandinavian plant (true *A. alpina*), as shown especially by the beautiful modern specimens collected by Alm, but also by older and more fragmentary specimens of *N. J. Anderson, Wickström, Åhrling & Brandelius*, and others, the sharp teeth or lobes of the ligules are 2–6 mm. long. In the large series of Greenland specimens (*A. angustifolia*) the teeth or lobes are much shorter, 0.5–1.5, rarely –2, mm. long. The difference is well brought out in the photograph, showing tips of ligules, × 2, Lapland specimens, both from Torne Lappmark, of true *A. alpina* at the left (FIG. 1, July 9, 1926, *Alm;* FIG. 2, August 14, 1923, *Alm*); a Greenland specimens at right (FIG. 3).

Ligules, × 2, of ARNICA ALPINA (FIGS. 1 and 2); of var. ANGUSTIFOLIA (FIG. 3).

EXPLANATION OF PLATES 279 AND 280

PLATE 279. TYPE of RANUNCULUS PEDATIFIDUS J. E. Sm., from Siberia, coll. *Gmelin*, in Linnean Herb. (Photograph, × 1, presented by Dr. *H. K. Svenson*, through Mr. *R. G. Pugsley* of the Linnean Society of London).

PLATE 280. FIG. 1, RANUNCULUS PEDATIFIDUS from Mt. Sinjuck in the Altai, Siberia, May 22, 1901, *Krylov;* FIG. 2, from Elbow River, Alberta, *J. Macoun*, no. 18,035; FIG. 3, R. PEDATIFIDUS, var. LEIOCARPUS (Trautv.) Fern., from Disko, Greenland, July 1, 1929, *R. T. Porsild;* FIG. 4, from Melville Island, 1820, *John Edwards*, ISOTYPE of *R. affinis* R. Br. Photograph by Dr. *L. B. Smith*, all specimens × 1.

HAMAMELIS VIRGINIANA IN MISSOURI

JULIAN A. STEYERMARK

IN 1911 Sargent described[1] under the name *Hamamelis vernalis* a new species based upon material from Missouri, northern Arkansas, and eastern Oklahoma. This new species was distinguished from the eastern *H. virginiana* with which it had been confused by the following characteristics, namely, (1) the period of anthesis occurred be-

[1] Sargent, C. S. Trees and Shrubs. **2**: 137. 1911.

tween the last of January and the first of April instead of late autumn and early winter, (2) the inner surface of the calyx-lobes was suffused with reddish, whereas in *H. virginiana* it was entirely greenish or yellowish-green, (3) the youngest branchlets were densely stellate-tomentose, whereas they were less pubescent to finally glabrate or nearly so in *H. virginiana*, (4) the plants spread vegetatively by an extensive underground shoot system which resulted in thickets, and (5) the habitat was gravelly beds of streams or rocky bars along creeks instead of upland areas and wooded slopes. Moreover, in *H. vernalis* the bases of the leaf-blades tended towards subcuneate.

In Missouri *H. vernalis* has hitherto been the only species known to the state, and is found only in the Ozark Region in the southern portion of the state, chiefly in the Iron Mountain and St. Francois Hills section of southeastern Missouri, and along the White River and tributaries in the southwestern part of the state. Its range extends north in the Ozark region to Pulaski and Jefferson counties.

In the early part of November, 1930, the writer visited the so-called "Royal Gorge" in Iron Co., in the southeastern Ozark region of Missouri. This "gorge" is one of many similar canyons in the granitic and porphyritic trachyte region which has been chiselled by stream erosion. In the narrow bouldery stream-bed grew thickets of fruiting *Hamamelis vernalis* with its characteristic bushy habit of growth; but on the lower rocky wooded slopes of the canyon above the stream-bed occurred numerous plants of another *Hamamelis* in full bloom! This was quite unusual, since the Ozark Witch Hazel, *H. vernalis*, blooms from January to April and grows in rocky stream-beds and along gravel bars; but none of the plants of *H. vernalis* in the stream-bed were in bloom, nor showed any signs of coming into bloom for a long time. An examination of the young branchlets of the season of the flowering plants growing on the wooded slopes revealed that their twigs were slightly pubescent to glabrate; also there was no reddish coloring on the inner surface of the calyx-lobes. Such evidence seemed to point to the fact that these late-flowering plants were *H. virginiana* rather than *H. vernalis*.

Not until the latter part of February, 1933, did the writer have an opportunity to re-visit this interesting locality. Then the situation was exactly the reverse to that of the previous visit. All the plants occurring in the rocky stream-bed were in full flower, and showed all the distinguishing traits of *H. vernalis*. On the other hand, none of

the plants growing on the wooded slopes above the stream-bed were in flower. That they had already blossomed two or more months previously was shown by the fact that the petals had mostly fallen from the calyx, and in a few cases in which they were still attached they were mainly dried and brown. Moreover, the *Hamamelis* of the wooded slopes all showed the youngest branchlets to be slightly pubescent or glabrate, whereas those of the plants in the rocky stream-bed were densely tomentose.

A comparison of material of the autumn-flowering *Hamamelis* from "Royal Gorge" with herbarium specimens of the eastern *H. virginiana* in the Missouri Botanical Garden Herbarium as well as with living plants of this species growing in the Missouri Botanical Garden likewise served to identify these plants with *H. virginiana*. At this season of the year, i. e., late February, the ovary of the autumn-flowering plants at "Royal Gorge" was very small, and was practically no more developed than in anthesis. This fact was also borne out upon comparison of the ovaries with the living plants of *H. virginiana* in the Missouri Botanical Garden. The appearance of the inner surface of the calyx was likewise similar in both.

The same locality was studied during the first week in November, 1933, and the situation was exactly as expected, that is, the *Hamamelis vernalis* of the rocky stream-bed was in the dormant winter-bud stage, and showed no signs of blooming for some months, whereas the *H. virginiana* of the rocky slopes and ground above and along the stream course was in full bloom with lemon-yellow petals and the inner surface of the calyx-lobes greenish or yellowish-green.

With this evidence at hand it was expected that with careful search *Hamamelis virginiana* might be found in some of the surrounding counties of the state where granitic or porphyritic trachyte canyons abound. Accordingly, a trip was made the following week in November to adjacent Reynolds county. Along the East Fork of the Black River in southern Iron Co. and again in Reynolds Co. were many plants of *H. virginiana* in full bloom on the lower slopes of the hills and in the wooded valleys. It was interesting to note that where both *H. vernalis* and *H. virginiana* occurred in the same region there was a slight overlap in habitat, the former extending to the outer margin of the gravel bars and rocky stream-beds and the latter close to the rocky portion of the stream bar. However, the former kept to the rockiest portions of the stream bar and never occurred on the adjacent

wooded slopes, whereas the latter was common on the rocky wooded slopes, and while descending to the wooded valley to the edges of the rocky stream-bed did not take to the rockiest portion of the bar as did *H. vernalis*. Although these two species may occur side by side in Missouri, there is no opportunity for natural crossing to occur, since the time of anthesis is quite different. Also the distinctive morphological characters for each species have been maintained throughout.

There can be no doubt, then, that both species of *Hamamelis*, i. e., *H. vernalis* and *H. virginiana*, occur in Missouri. It is not surprising to find *H. virginiana* in eastern Missouri, and especially in the southeastern Ozark region, inasmuch as quite a number of eastern species are known in Missouri only from this southeastern area, such as *Pedicularis lanceolata*, *Goodyera pubescens*, *Lycopodium complanatum* var. *flabelliforme*, *Dennstaedtia punctilobula*, *Thelypteris spinulosa* var. *intermedia*, *Asplenium pinnatifidum*, *Ilex verticillata* var. *padifolia*, *Rhododendron roseum*, *Viola pallens*, *Frasera caroliniensis*, *Phlox maculata*, and many others. Moreover, quite a few of these eastern species in the southeastern Ozark region are known only from the Iron Mountain section, such as *Ilex verticillata* var. *padifolia*, *Pedicularis lanceolata*, and *Phlox maculata*. Associated with the *Hamamelis virginiana* on the wooded slopes at "Royal Gorge" were such eastern species as *Quercus coccinea*, *Acer saccharum* var. *glaucum*, *Acer rubrum*, *Ostrya virginica*, *Vaccinium arboreum* var. *glaucescens* and along the stream-bed *Ilex verticillata* var. *padifolia*, *Alnus rugosa*, and *Gentiana quinquefolia*. At the time of the influx or migration of many of these eastern species into the southeastern Ozark region *Hamamelis virginiana* probably appeared along with its associates, *Quercus coccinea*, *Acer rubrum*, *Acer saccharum* var. *glaucum*, *Ostrya virginica*, *Ilex verticillata* var. *padifolia*, and a number of others. This eastern invasion into southeastern Missouri may have occurred near the close of the Tertiary following the last uplift of the Ozark region, or it may have taken place following one of the retreats or advances of one of the Pleistocene ice-movements. The appearance of *Hamamelis virginiana* in this section of southeastern Missouri is therefore in accordance with the occurrence of a number of other eastern species which reach the Ozark region in limited distribution.

Missouri Botanical Garden, St. Louis.

Volume 36, no. 422, including pages 25 to 60, was issued 1 February, 1934.

Type of Ranunculus pedatifidus, × 1.

RANUNCULUS PEDATIFIDUS, × 1; FIG. 1, from the Altai; FIG. 2, from Alberta; FIG. 3, from Greenland; FIG. 4, from Melville Island (ISOTYPE of *R. affinis*).

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